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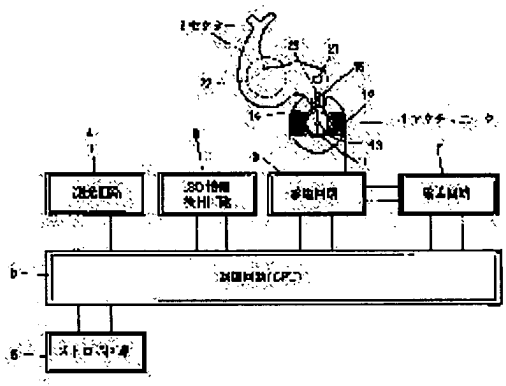
(54) CAMERA SHUTTER DEVICE

(57)Abstract:
PROBLEM TO BE SOLVED: To simplify an exposure control mechanism for a camera shutter device.
SOLUTION: The camera shutter device is provided with an actuator 1, a sector 2, a power supply circuit 3, a photometry circuit 4 and a control circuit 5. The actuator 1 is reciprocatively rotated when a power is supplied, and also, the rotating state is changed in accordance with the supplied power quantity. The sector 2 is opened/closed interlocking with the actuator 1 so as to perform an exposure operation of the camera. The variable power is supplied by the power supply circuit 3 to the actuator 1 so as to change the rotating state of the actuator 1, then, the operating state of the sector 2 interlocking with the actuator 1 can be controlled and the exposure amount can be adjusted. Prior to the exposure operation, information on the luminance of an object is fetched by the photometry circuit 4. The power supply quantity supplied from the power supply circuit 3 to the actuator 1 is changed by the control circuit 5 in accordance with the luminance information, then, the exposure quantity is controlled so as to become suitable for the object.



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CLAIMS

[Claim(s)]
[Claim 1] Shutter equipment for cameras characterized by providing the following. The actuator from which both-way rotation is carried out by electric supply, and a rotation state changes according to the amount of electric supply. The sector which interlocks, carries out switching action to this actuator, and performs exposure operation of a camera. The feeder circuit to which the operating state of the sector interlocked with this is controlled by performing adjustable electric supply to this actuator, and changing the rotation state to it, and regulation of light exposure is attained. The photometry circuit which incorporates a photographic subject's brightness information in advance of exposure operation, and the control circuit which controls light exposure which the amount of electric supply supplied to this actuator from this feeder circuit according to this brightness information was changed, and was suitable for the photographic subject.
[Claim 2] This power supply adjustable circuit embraces the switch signal outputted from this control circuit by the aforementioned feeder circuit's consisting of a drive circuit and a power supply adjustable circuit to which electric power is supplied in this, and this drive circuit energizing this actuator according to the timing signal outputted from this control circuit, and the amount of electric supply is shutter equipment for cameras according to claim 1 which can be switched gradually.
[Claim 3] The aforementioned power supply adjustable circuit is shutter equipment for cameras according to claim 2 from which the amount of electric supply changes in multi-stage by having the part piezo-resistance to supply voltage, and switching partial pressure resistance according to this switch signal.
[Claim 4] It is shutter equipment for cameras according to claim 1 which is attached in the stroboscope circuit which performs stroboscope luminescence synchronizing with exposure operation, and the aforementioned control circuit controls this stroboscope circuit according to this brightness information at least, and performs this stroboscope luminescence based on a photographic subject's situation when required.
[Claim 5] The aforementioned control circuit is shutter equipment for cameras according to claim 4 which controls this stroboscope circuit according to a photographic subject's situation, and enables regulation of the amount of stroboscope luminescence.
[Claim 6] The aforementioned control circuit is shutter equipment for cameras according to claim 4 which controls this stroboscope circuit according to a photographic subject's situation, and enables regulation of stroboscope luminescence timing.
[Claim 7] The aforementioned sector is shutter equipment for cameras according to claim 1 with which regulation of light exposure is attained because the switching-action range and switching-action speed change according to the rotation range and rotation speed of this actuator.
[Claim 8] The aforementioned actuator is shutter equipment for cameras according to claim 7 with which upper part regulation of the light exposure is carried out by the switching action of the sector with which the rotation range and rotation speed change up, and are interlocked with this according to the amount of electric supply switched up, so that a photographic subject's brightness is low.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] this invention relates to the shutter equipment for cameras. It is related with the exposure control technology in the shutter equipment for cameras in more detail.
[0002]
[Description of the Prior Art] The camera is various from a high-class thing to a low-grade thing, and the shutter equipment of a simple mechanism is comparatively adopted as the camera of a low price. The single ** shutter is known as one of the easiest equipment. This is the structure of making it running a sector (shutter wing) to the aperture of a lens at the speed fixed beforehand. Moreover, the shutter equipment which rotates a sector with opening of a path which is right and left different from central position of rest to one of right and left, and performs exposure operation is also known. Simple exposure control (light exposure control) is performed because this chooses opening of one of the right and left from which aperture differs. Furthermore, according to a photographic subject's brightness or the sensitivity of a film, possible shutter equipment is also known for automatic exposure control (AE) according to the predetermined algorithm. Since data and a program required for AE are stored, memory, such as ROM, is required.
[0003]
[Problem(s) to be Solved by the Invention] Although the single ** shutter equipment explained to the 1st is easy in mechanism, exposure control doubled with photographic subject brightness etc. cannot be performed. Therefore, the range of the photographic subject brightness in which camera photography is possible (henceforth, photography range) is narrow, and exaggerated exposure and undershirt exposure often arise. Moreover, although exposure control of at least 2 stages is possible for the right-and-left rotation type shutter equipment explained to the 2nd, the space which enables right-and-left rotation of a sector is needed, and it has the technical problem that it becomes the hindrance of miniaturization. Moreover, it is the grade which the photography range expands a little in about two steps of exposure control as compared with the first single ** shutter equipment. With AE shutter equipment furthermore explained to the 3rd, in order to perform automatic exposure control, mass memory is needed and the technical problem that it becomes the factor of a cost rise occurs.
[0004]
[Means for Solving the Problem] in order to solve the technical problem of a Prior art mentioned above, this invention was excellent in comparatively easy structure at the low price and space factor in which exposure control is possible -- it aims at offering the shutter equipment for cameras The following meanses were provided in order to attain this purpose. That is, the shutter equipment for cameras concerning this invention is equipped with an actuator, the sector, the feeder circuit, the photometry circuit, and the control circuit. An actuator carries out both-way rotation by electric supply, and a rotation state changes according to the amount of electric supply (voltage or current). A sector interlocks, carries out switching action to this actuator, and performs exposure operation of a camera. A feeder circuit is performing adjustable electric supply to this actuator, and changing the rotation state to it, the operating state of the sector interlocked with this actuator is controlled, and regulation of light exposure is attained. A photometry circuit incorporates a photographic subject's brightness information in advance of exposure operation. A control circuit controls light exposure which the amount of electric supply (voltage or current) supplied to this actuator from this feeder circuit according to this brightness information was changed, and was suitable for the photographic subject.
[0005] Specifically, the aforementioned feeder circuit consists of a drive circuit and a power supply adjustable circuit to which electric power is supplied in this. A drive circuit energizes this actuator according to the timing signal outputted from the aforementioned control circuit. According to the switch signal outputted from the aforementioned control circuit, the amount of electric supply (voltage) can switch this power supply adjustable circuit gradually. Specifically, the aforementioned power supply adjustable circuit is equipped with the part piezo-resistance to supply voltage, and output voltage changes in multi-stage by switching partial pressure resistance according to the aforementioned switch signal. Preferably, the shutter equipment for these cameras is attached in the stroboscope circuit which performs stroboscope luminescence synchronizing with exposure operation. In this case, the aforementioned control circuit controls this stroboscope circuit according to brightness information at least, and based on a photographic subject's situation, when required, it performs stroboscope luminescence. Still more preferably, the aforementioned control circuit controls this stroboscope circuit according to a photographic subject's situation, and enables regulation of the amount of stroboscope luminescence. Or the aforementioned control circuit controls this stroboscope circuit according to a photographic subject's situation, and enables regulation of stroboscope luminescence timing.
[0006] According to this invention, a sector interlocks, and carries out switching action to an actuator, and exposure operation of a camera is performed. For example, as for this sector, regulation of light exposure is attained because the switching-action range and switching-action speed change according to the rotation range and rotation speed of an actuator. On the other hand, as for an actuator, the rotation range and rotation speed change, corresponding directly to the amount of electric supply (voltage or current). And the

control circuit which consists of a CPU etc. is changing the voltage or current supplied to an actuator from a feeder circuit according to brightness information. For example, the amount of electric supply is switched for a photographic subject's brightness information to a low case up. Thereby, the rotation range and rotation speed of an actuator change up, and upper part regulation of the light exposure is carried out by the switching action of the sector interlocked with this. Thus, in this invention, the rotation state of an actuator is controlled directly by switching the amount of electric supply according to brightness information at least, and light exposure is adjusted by the switching action of the sector interlocked with this actuator.

[0007]

[Embodiments of the Invention] With reference to a drawing, an operation gestalt with a best this invention is explained in detail below. Drawing 1 is the block diagram showing the overall composition of the shutter equipment for cameras concerning this invention. The shutter equipment for these cameras is equipped with an actuator 1, a sector 2, a feeder circuit 3, the photometry circuit 4, the control circuit 5, the stroboscope circuit 6, the ISO information detector 8, and the feed circuit 7 so that it may illustrate. An actuator 1 carries out both-way rotation by electric supply, and a rotation state (rotation range and rotation speed) changes according to the amount of electric supply (voltage or current). With this operation gestalt, this actuator 1 is a MUBINGU magnet type, and consists of a permanent magnet 11 and a coil 12. A permanent magnet 11 is a rotatable centering on a shaft 13. The arm 14 is attached in the permanent magnet 11 in one. The operation pin 15 is implanted at the nose of cam of an arm 14. A permanent magnet 11 rotates by energizing in a coil 12 through a feeder circuit 3. A permanent magnet 11 carries out both-way rotation of the energization direction by switching ****. A sector (shutter wing) 2 interlocks, carries out switching action to an actuator 1, and performs exposure operation of a camera. Centering on a shaft 21, a sector 2 is a rockable, and opens and closes an aperture 22. The long hole 23 is formed in the edge of a sector 2, and the operation pin 15 by the side of the actuator 1 mentioned above in this is being engaged. In addition, although one sector 2 is shown drawing, it is made to cover an aperture 22 completely using the sector of a couple in fact. The sector of a couple is driven with the appearance actuator it runs to opposite direction.

[0008] A feeder circuit 3 is performing adjustable electric supply to an actuator 2, and changing the rotation state (rotation range and rotation speed) to it, the operating state (switching-action range and switching-action speed) of the sector 2 interlocked with this is controlled, and regulation of light exposure is attained. The photometry circuit 4 incorporates a photographic subject's brightness information in advance of exposure operation. A control circuit 5 consists of a CPU of a computer etc., and controls light exposure which the amount of electric supply (voltage or current) supplied to an actuator 1 from a feeder circuit 3 according to brightness information was changed, and was suitable for the photographic subject. Specifically, as for a sector 2, regulation of light exposure is attained because the switching-action range and switching-action speed change according to the rotation range and rotation speed of an actuator 1. In this case, upper part regulation of the light exposure is carried out by the switching action of the sector 2 with which the rotation range and rotation speed change up, and an actuator 1 is interlocked with this according to the amount of electric supply switched up, so that a photographic subject's brightness is low.

[0009] With this operation form, the stroboscope circuit 6 is attached and stroboscope luminescence is performed synchronizing with exposure operation. A control circuit (CPU) 5 controls the stroboscope circuit 6 according to brightness information at least, and based on a photographic subject's situation, when required, it performs stroboscope luminescence. Preferably, a control circuit 5 controls the stroboscope circuit 6 according to a photographic subject's situation, and enables regulation of the amount of stroboscope luminescence. Moreover, preferably, a control circuit 5 controls the stroboscope circuit 6 according to a photographic subject's situation, and enables regulation of stroboscope luminescence timing. In addition, the ISO information detector 8 is a thing for detecting automatically the ISO information on the film with which the camera was loaded (sensitivity), and incorporating to a control circuit 5. Moreover, the feed circuit 7 is formed in order to perform feed (coma delivery), rewinding, etc. [of the film with which the camera was loaded]

[0010] Drawing 2 is the plan showing the mechanical composition of the shutter equipment for cameras concerning this invention. Shutter equipment is assembled using the base plate 0 so that it may illustrate. The aperture 22 is formed in the center of a base plate 0. The sector 2 arranges so that this aperture 22 may be covered. In addition, in order to make illustration easy, only the sector 2 of one sheet is shown. A sector 2 is a rockable centering on the shaft 21 implanted in the base plate 0. The actuator 1 is built into the base plate 0 through the supporting plate 16. The operation pin 15 of an actuator 1 is engaging with the long hole 23 formed in the sector 2. The sector 2 shown as the solid line is in a closed position, and has covered the aperture 22 completely in the state where it lapped with other sectors (not shown) partially. If an actuator 1 rotates clockwise according to energization of the forward direction, a sector 2 will run in the position shown by the dotted line from the position shown as the solid line. The sector 2 shown by the dotted line is in an open position, and opens an aperture 22 completely. Rotating counterclockwise, if an opposite direction is energized to an actuator 1 after this, according to this, a sector 2 returns from the open position shown by the dotted line to the closed position shown as the solid line.

[0011] Drawing 3 is the circuit diagram showing the electric composition of the shutter equipment for cameras concerning this invention. The feeder circuit 3 shown in drawing 1 consists of a drive circuit 31 and a power supply adjustable circuit 32 to which electric power is supplied in this. The drive circuit 31 energizes an actuator 1 according to the timing signal outputted from CPU5. Specifically, this drive circuit 31 consists of four transistors TR3-TR6 connected between the power supply line 33 and the grounding line. When performing exposure operation, the timing signal outputted from CPU5 will be answered, TR3 and TR6 will be in switch-on, and forward direction energization is performed to the coil of an actuator 1. After predetermined time passes, the timing signal again outputted from CPU5 is answered, shortly, TR5 and TR4 will be in switch-on, and opposite direction energization is performed in the coil of an actuator 1. By the above, an actuator 1 carries out both-way rotation.

[0012] On the other hand, according to switch signal H/L outputted from CPU5, the amount of electric supply can switch the power supply adjustable circuit 32 gradually. In this example, the power supply adjustable circuit 32 is equipped with the partial pressure resistance R1-R3 by which the series connection was carried out between the power supply line 33 and the grounding line, and the amount of electric supply (specifically supply voltage) changes in multi-stage by switching the partial pressure resistance R1 according to switch signal H/L. In addition, although supply voltage changes in two stages in this example, this invention is not

restricted to this and you may make it switch supply voltage above a three-stage. Furthermore, this power supply adjustable circuit 32 is equipped with the transistor TR2 for switching the partial pressure resistance R1 according to a switch signal. In addition, the transistor TR1 and operational amplifier 34 by which it is placed between the power supply lines 33 are included. It has connected with the base terminal of TR1, and the output terminal of an operational amplifier 34 performs flow control of TR1. 1V are impressed to one input terminal of an operational amplifier 34 as a reference voltage Vref. The input terminal of another side of an operational amplifier 34 is connected to the middle point P of the partial pressure resistance R2 and R3. Here, the supply voltage which has equal resistance altogether and is supplied to the power supply line 33 presupposes that it is three partial pressure resistance R1-R3 3V. If it switches from CPU5 and Signal H is outputted, TR2 will be put on non-switch-on. Therefore, between a power supply line and a grounding line, three partial pressure resistance R1-R3 will be in-series, and will intervene. Resistance division of supply voltage 3V is carried out by the partial pressure resistance R1-R3, and the potential of 1V appears in the middle point P. An operational amplifier 34 carries out opening-and-closing control of the appearance TR1 which maintains the potential of the middle point P to 1V. Consequently, it switches to the power supply line 33, and supply voltage 3V appear according to Signal H. Electric power is supplied to this as it is in the drive circuit 31. On the other hand, when it switches from CPU5 and Signal L is outputted, TR2 will be in switch-on and the partial pressure resistance R1 will be removed from a series connection. Even in this case, since an operational amplifier 34 controls the appearance TR1 which maintains the potential of the middle point P to 1V, in the power supply line 33, the supply voltage of 2V will appear as a result. This is supplied to the drive circuit 31. As mentioned above, the power supply adjustable circuit 32 switches supply voltage in two stages according to switch signal H/L outputted from CPU5.

[0013] The photometry circuit 4 consists of a photoelectrical sensor 41, a comparator 42, and three resistance R4-R6. The photoelectrical sensor 41 supplies the voltage signal according to the amount of extraneous lights to a comparator 42. A comparator 42 supplies the brightness information by which binarization was carried out by carrying out comparison processing of this voltage signal to the CPU5 side. CPU5 outputs switch signal H/L mentioned above according to this brightness information to the power supply adjustable circuit 32 side. When the brightness information by which binarization was carried out is specifically in a low side, while outputting the switch signal H, when brightness information is in a high-level side, the switch signal L is outputted. That is, when photographic subject brightness is comparatively low, the high voltage is supplied to the drive circuit 31, and when photographic subject brightness is comparatively high, electric power is supplied to a low battery at the drive circuit 31 side.

[0014] The stroboscope circuit 6 consists of switches SCR 2 for OFF which consist of a thyristor etc. as well as the switch SCR 1 for ON which consists of a xenon lamp 61, the main capacitor C1, a commutating capacitor C2, a thyristor, etc. A xenon lamp 61 performs stroboscope luminescence synchronizing with exposure operation. CPU5 controls SCR1 and SCR2 according to brightness information at least, and based on a photographic subject's situation, when required, it performs stroboscope luminescence. CPU5 performs ON/OFF control of SCR1 and SCR2 according to a photographic subject's situation further, and enables regulation of the amount of stroboscope luminescence, and stroboscope luminescence timing. Thus, this operation form is equipped with the automatic stroboscope control function. That is, in addition to photographic subject brightness, the reflection from photographic subject distance and also a photographic subject front face is gathered, and the amount of stroboscope luminescence and stroboscope luminescence timing are automatically controlled by this operation form according to these. For example, although brightness information is enough when taking a photograph by the backlight, stroboscope luminescence is performed and a photographic subject's clear image pck-up is made to be obtained. Stroboscope luminescence timing is changed depending on the case, and the switch of the so-called hillside luminescence and peak luminescence is enabled.

[0015] Next, with reference to drawing 4 , operation of the shutter equipment for cameras concerning this invention is explained in detail. (A) expresses aging of the voltage impressed to an actuator. The solid line shows change of the driver voltage VH to which electric power is supplied according to the switch signal H, and the dashed line expresses the driver voltage VL to which electric power is supplied according to the switch signal L. If a release switch is thrown in in order to perform exposure operation, +VH or +VL will be energized by the actuator to timing t1. This forward direction energization is turned off [it] to the following timing t2. Simultaneously, -VH or -VL is impressed to an actuator and opposite direction energization is performed. Opposite direction energization is turned off [it] to the last timing t3.

[0016] (B) expresses aging of the diameter of shutter opening according to energization of an actuator. A solid line SH expresses the diameter change of opening according to VH, and dashed-line SL expresses the diameter change of opening according to VL. If +VH of the high voltage is impressed comparatively, the high-speed run of the sector will be carried out from position of rest to an open position, it will be regulated by the stopper (not shown), and will stop. Then, -VH is answered and it returns to position of rest. In addition, if an aperture is maintained at a close-by-pass-bulb-completely state and it passes over this for a while after a sector starts from position of rest, the diameter of opening is expanded toward the full open state from the pinhole state. On the other hand, if +VL of a low battery is impressed comparatively, a sector will run by the low speed comparatively and timing t2 will not result in an open position, either. Then, -VL will be answered and a sector will return to position of rest. Thus, the operating characteristic depends for the actuator which consists of a MUBINGU magnet type etc. on the amounts of electric supply, such as voltage. Consequently, according to the amount of electric supply to an actuator, the time of the diameter of opening of a shutter or a second will change. In the example of illustration, if the amount of electric supply is high, while the diameter of attainment opening will become large, T also becomes long at the time of a second. On the other hand, if the amount of electric supply is comparatively low, T-x will also become [the diameter of attainment opening] small short at the time of a second.

[0017] Drawing 5 expresses the photography range typically, (A) shows the conventional photography range and (B) shows the photography range acquired by this invention. In the conventional example shown in (A), supply voltage is not switched and supply voltage is being fixed to VH. Therefore, aging of the diameter of shutter opening is expressed with SH shown in (B) of drawing 4 . Now, in Curve SH, area velocity is 5 and it is assumed that TV value is 7. In addition, TV value is a numeric value corresponding to T at the time of the second shown in (B) of drawing 4 , and TV value becomes small, so that the time of a second is large. On the other hand, area velocity is a numeric value corresponding to the diameter of opening shown in (B) of drawing 4 , and area velocity becomes small, so that the diameter of opening is large. In addition, five correspond to AVF5.6. Moreover, TV7 corresponds to 1/125

at the time of a second. In this case, the proper exposure value EV serves as AV5+TV7=EV12. In automatic baking which generally took the sensitivity property of a film into consideration, about **1 EV can carry out amendment baking satisfactory. Thereby, in the conventional example, the photography range to EV11-about 13 EV is securable.

[0018] In the example of this invention shown in (B), the two-step switch of supply voltage is performed and SL other than SH shown in (B) of drawing 4 can be chosen. Suppose now that AV6 (F8) and TV8 (1/250) are obtained by SL. In this case, the proper exposure value EV serves as AV6+TV8=EV14. about **1 EV of furthermore, the both sides -- abbreviation -- it can burn satisfactory Therefore, according to this example, the photography range can be expanded from EV11 to about 15 EV by adopting a two-step switch of supply voltage. Furthermore, the photography range is expandable by increasing a switch number of stages. Moreover, in this invention, the photography range is expanded to about nine EV by combining stroboscope luminescence. In this case, the fine exposure control based on a photographic subject's situation by adopting automatic stroboscope luminescence control is possible.

[0019] Finally with reference to the flow chart of drawing 6 , overall operation of the shutter equipment for cameras concerning this invention is summarized. The strength of the light is first measured at Step S1, and a photographic subject's brightness information is incorporated. Next, based on brightness information, photographic subject information, film speed information on other, etc., the operation for exposure control is performed according to a predetermined algorithm at Step S2, and it progresses to Step S3. Here, it switches and having been outputted from CPU based on the result of an operation mentioned above judges in any of H or L a signal is [or]. In L, it progresses at step S4, and supply voltage is switched to a low side. It progresses to Step S5 after this. It progresses to Step S5, maintaining to a high level without on the other hand, performing a supply voltage switch, when a switch signal is H. If it results in timing t1 (refer to drawing 4) here, forward direction energization is turned on. It can come, simultaneously a timer is started at Step S6, and counting of the elapsed time t is carried out. It judges whether stroboscope luminescence should be performed at Step S7. It progresses to Step 8, without branching to Step S13, when not performing stroboscope luminescence. It judges whether elapsed time t resulted in the following timing t2 at Step S8. If it becomes t=t2, forward direction energization is turned off by step S9. Opposite direction energization is immediately turned on at Step S10 after this. Step S11 -- t=t3 up to -- it maintains for a while Finally opposite direction energization is turned off at Step S12. Exposure operation which followed by this for any of Curve SH or SL shown in (B) of drawing 4 being is performed. In addition, when it has the structure where an actuator can always return to hibernation, even if it carries out, it is not necessary to perform opposite direction energization processing of Step S10 - Step S12. On the other hand, when it is judged at Step S7 that stroboscope luminescence is required, operating procedure branches also to Step S13 side while progressing to Step S8 side mentioned above. It judges whether it resulted in the timing which makes stroboscope luminescence turn on at Step S13. When it results in this timing, a stroboscope is made to actually emit light at Step S14. Then, a stroboscope is turned off if luminescence time predetermined at Step S15 passes. Stroboscope luminescence through these steps S13-S15 is performed synchronizing with the exposure operation through Step S3 - Step S12.

[0020]

[Effect of the Invention] As explained above, according to this invention, light exposure which the amount of electric supply to which electric power is supplied by the actuator from a feeder circuit according to brightness information was changed gradually, and was suitable for the photographic subject is controlled. Thereby, it compares with the former and-izing of the photography range can be carried out [****]. Furthermore, the photography range is further expandable if stroboscope luminescence is used together. The shutter equipment for cameras concerning this invention is controlling the switching-action range and switching-action speed of a sector by the switch of supply voltage, using the voltage response characteristic of an actuator as it is. Therefore, it is the composition simplified extremely electrically, and the exposure-also mechanically control at the sacrifice of a space factor is attained.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the block diagram showing the overall composition of the shutter equipment for cameras concerning this invention.
[Drawing 2] It is the plan showing the mechanical composition of the shutter equipment for cameras concerning this invention.
[Drawing 3] It is the circuit diagram showing the electric composition of the shutter equipment for cameras concerning this invention.
[Drawing 4] It is the timing chart with which explanation of the shutter equipment for cameras concerning this invention of operation is presented.
[Drawing 5] It is the ** type view with which explanation of the shutter equipment for cameras similarly applied to this invention of operation is presented.
[Drawing 6] It is the flow chart with which explanation of the shutter equipment for cameras similarly applied to this invention of operation is presented.
[Description of Notations]
1 -- actuator and 2 -- -- a sector, 3 -- feeder circuit, 4 -- photometry circuit, and 5 -- -- a control circuit (CPU), 6 -- stroboscope circuit, 11 -- permanent magnet, and 12 -- -- a coil, 13 -- shafts, 14 -- arm, and 15 -- -- an operation pin, 21 -- shafts, 22 -- aperture, and 23 -- -- a long hole, 31 -- drive circuits, 32 -- power supply adjustable circuit, and 33 -- -- a power supply line, a 41 -- photoelectrical sensor

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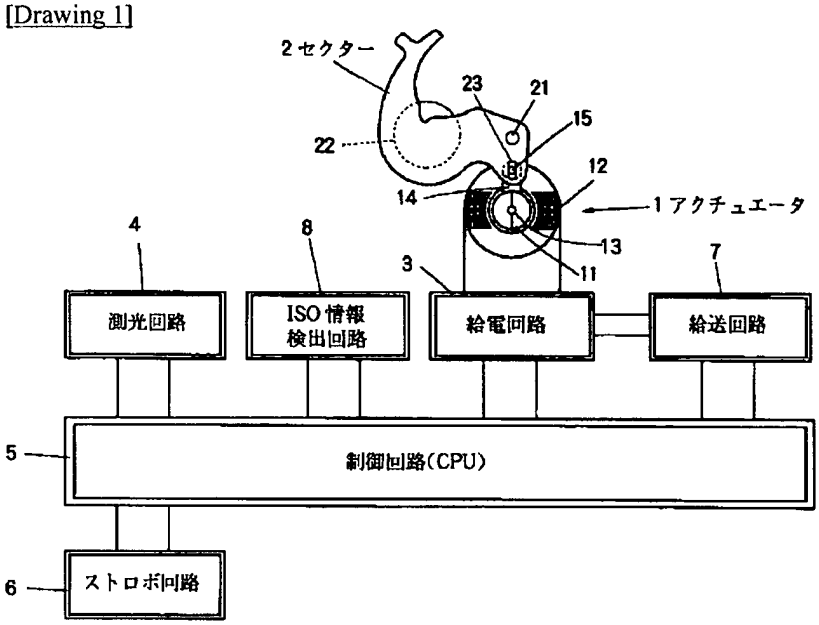
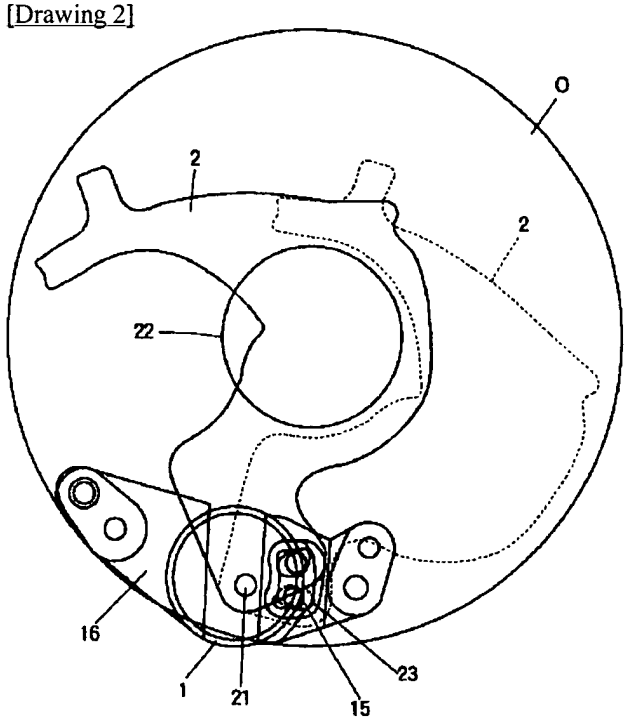
DRAWINGS

[Drawing 1]



[Drawing 2]



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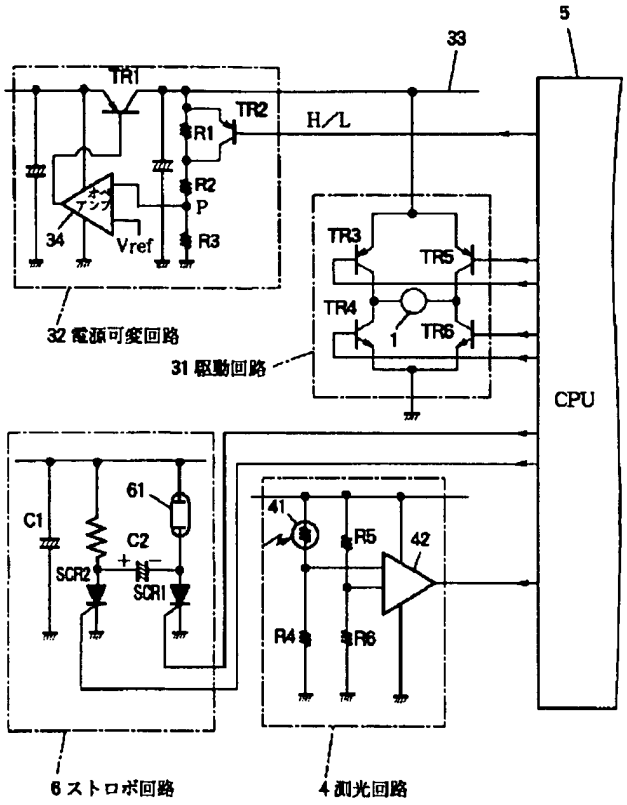
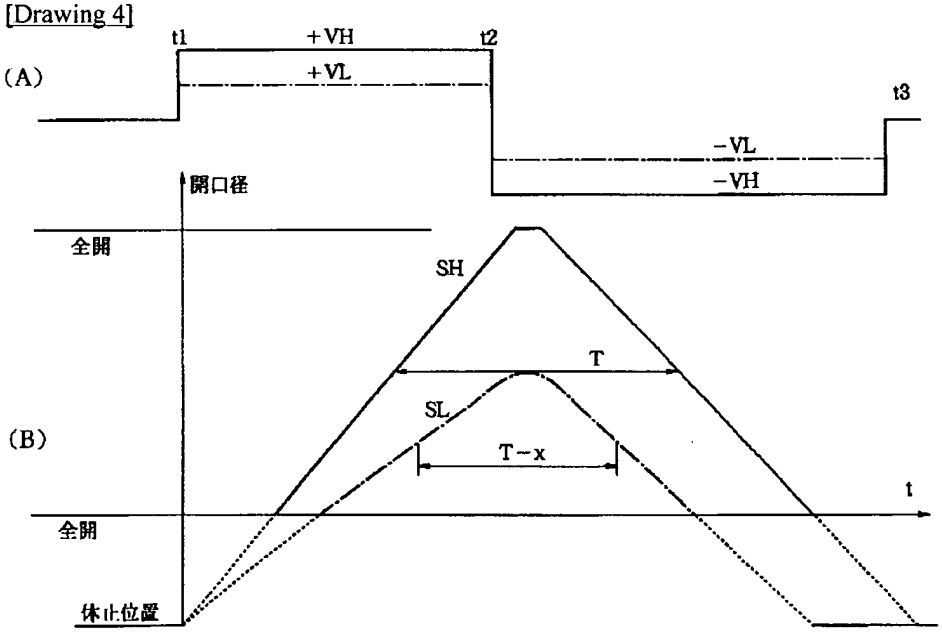
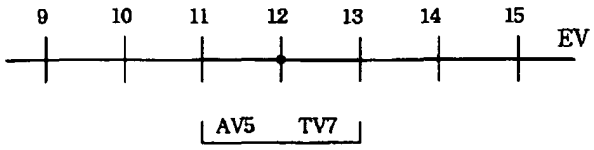


[Drawing 4]



[Drawing 5]

(A)



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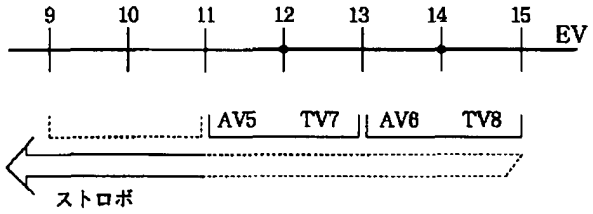
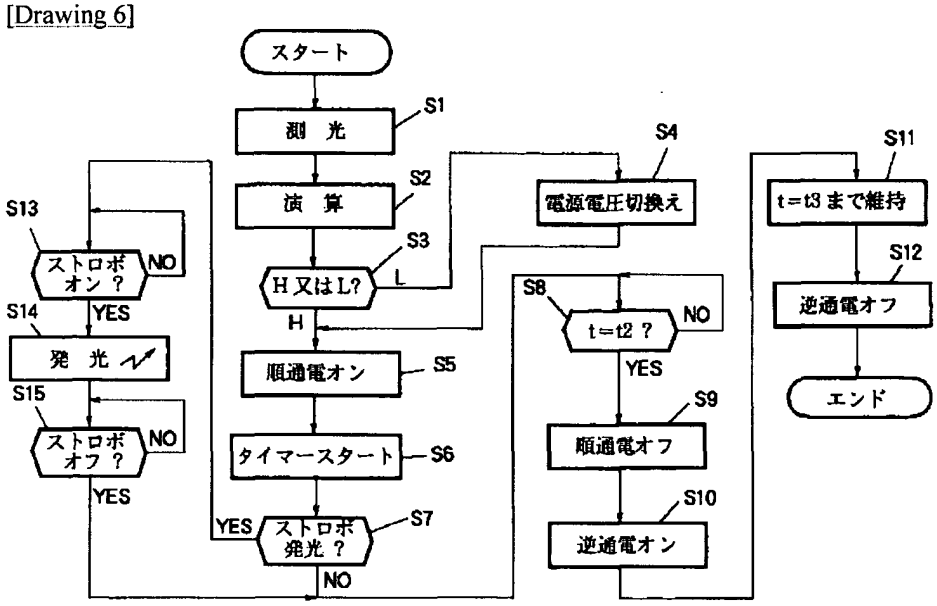


[Drawing 6]



[Translation done.]